Study of Level of Consciousness and Electrolyte Abnormalities in Patients Admitted to Intensive Care Unit (ICU)

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ABSTRACT

Introduction: An altered level of consciousness can be commonly seen in patients admitted to the intensive care unit (ICU). A decreased level of consciousness correlates to increased morbidity and mortality. Study aimed to see the level of consciousness in critically ill patients or patients of intensive care unit (ICU) and to study level of electrolytes in critically ill patients or patients of intensive care unit (ICU)

Material and methods: A total of 100 randomly selected patients from 4 different intensive care units were enrolled for the study. GCS Score and lab parameters comprising the serum electrolytes Na, K, Cl of the patients on Day one of ICU admission were recorded and the mean levels calculated. General and systemic examination of the patients was also done.

Result: Our results clearly show a reduced or low mean sodium level (134±7.5 meq/L) in 30% patients of the ICU. The distribution of patients in each subgroup of GCS was unequal; mostly patients exhibiting well preserved consciousness state. The mean serum sodium level in each group of GCS is variable and cannot be graded with progressive decline in sensorium. Hence we cannot correlate the altered consciousness levels with the degree of hyponatremia.

Conclusion: An accurate and reliable evaluation of the state of consciousness in Intensive Care Unit patients is of primordial importance for their management. Electrolyte disturbances are also common in ICU settings. Timely recognition, a high index of suspicion and a thorough understanding of these abnormalities are necessary to ensure their correction and reduce morbidity and mortality.

Keywords: Level of Consciousness, Morbidity, Mortality, Homeostasis, Electrolyte Derangements, Sensorium, Hyponatremia.

INTRODUCTION

It is of prime importance to have an accurate and reliable evaluation of the state of consciousness in intensive care unit (ICU) patients for their appropriate treatment. Altered states of consciousness are commonly seen in ICU's. It is seen that in neurological and neurosurgical ICU's altered states of consciousness are the main reason for the adult ICU admission in 3% to 7% of cases. It is observed that the state of consciousness comprises either the state of wakefulness awareness or alertness in which most human beings function while not asleep; or one of the recognized stages of normal sleep from which the person can be readily awakened.[1] The abnormal state of consciousness is more complex to define and characterize, as it is evidenced by the many terms applied to altered states of consciousness by various persons. Various terms are clouding of consciousness, confusional state, delirium, lethargy, obtundation, stupor, dementia, hypersomnia, vegetative state akinetic, mutism, locked-in syndrome, coma and brain death.[1]

Observations should be done to assess:-

- Glasgow coma scale (GCS)
- Pupil size and reactivity
- Limb Movements (NICE, 2007)

Electrolyte abnormalities are common in patients who need intensive care. They occur in a variety of conditions, and many remain unrecognized and result in morbidity and mortality, irrespective of the primary problem. Timely recognition, a high index of suspicion and a thorough understanding of common electrolyte abnormalities is necessary to ensure their correction.[2] Disturbances in electrolyte balances in mathematically measurable biochemical parameters in the blood stream determines the clinical manifestations of interactions between various metabolic events such as sepsis, hormones, vascular events, medications, hydration deficiencies and renal physiology.[3]

The present study was planned to study the frequency of electrolyte imbalance at admission in patients admitted to ICU and also to study co-relation between level of consciousness and electrolyte abnormalities. It is useful to have a standard scale by which we can measure levels of consciousness; this has advantage for several reasons. Communication among physicians about the neurologic condition of a patient is improved, guidelines for diagnostic and therapeutic intervention in certain situations can be linked to the level of consciousness and in some situations rough estimate of prognosis can be made based partly on the scale score. In order for such a scale to be useful, it must be simple to learn, understand and implement.

Study aimed to see the level of consciousness in critically ill patients or patients of intensive care unit (ICU) and to study level of electrolytes in critically ill patients or patients

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of intensive care unit (ICU) with the objectives to study the level of consciousness in patients admitted to Intensive Care Unit, to study spectrum of electrolyte abnormalities in patients admitted to Intensive Care Unit and co- relation of level of consciousness and the electrolyte abnormalities with disease status.

MATERIAL AND METHODS

The cohort type of study was approved by the Institutional Ethical Committee. It was carried out between 11.9.2016 and 1.6.2017. The study was carried out at a tertiary centre in the catchment area which is a rural area. The institute is providing charitable, free of cost treatment to patients who mostly belong to the lower socio economic status. The study consists of 100 randomly selected patients admitted to various Intensive care units (ICU) of SKNMC and GH namely

a. Surgical ICU – 27 Patients
b. Medicine ICU – 27 Patients
c. Respiratory (IR) ICU – 23 Patients
d. Obstetrics and Gynaecology (Obgy) ICU – 23 Patients

The inclusion criteria included all patients who agreed to take part in the study. Exclusion criteria were patients who refused to be in part of the study and/ or patients who refused to give blood.

Systemic and General Examinations of all selected patients was done and recorded. GCS Score and lab parameters comprising the serum electrolytes Na, K, Cl of the patients on Day 1 of ICU Admission were recorded.The estimation of electrolytes- Sodium, Potassium and Chloride was done on ion-selective electrode (ISE) analyser. The normal accepted range for sodium is 135 to 145 mEq/L. The normal range for potassium is 3.5 to 5.5 mEq/L The normal adult value for chloride is 96-106 mEq/L.

No of patients	Mean Na (mEq/L)	Mean K (mEq/L)	Mean Cl (mEq/L)
100	134±7.5	4.50±0.78	99.7±8.06

Table-1: Mean electrolyte levels

Age (in years)	Males (n)	Females (n)
20-30	6	6
31-40	5	8
41-50	10	7
51-60	10	8
61 and above	21	19
Total	52	48

Table-2: Age vs sex distribution

GCS score	Number of patients
3-5	3
6-10	7
11-15	90

Table-3: GCS vs.number of patients

STATISTICAL ANALYSIS

Results and Tables were made using the computer software – Microsoft Word and analyzed using descriptive statistics.

RESULTS

The study was carried out in 100 subjects.A total of 100 patients from the age group of 20 to 61 years and above admitted to various ICU's namely medicine, surgical, respiratory and Gynae ICU's were enrolled for the study.

There were 52% males (n=52) and 48% females(n=48) setting a male female ratio of 13:12 (n=100).

As shown in Table no 1, Our study shows the following results for 100 patients.Mean Na Level -134 ± 7.5 mEq/L, Mean K+ Level - 4.50 ± 0.78mEq/L, Mean Cl Level - 99.7 ± 8.06mEq/L

Table 2 shows age vs sex distribution. It Shows that ICU admission is more common in the age of 61 years and above in both males (n=21) and females (n=19).

Table 3 shows GCS Vs.Number of Patients. It clearly shows maximum number of ICU admissions (n=90) in the Glasgow coma scale score of 11-15

Table 4 shows GCS vs mean electrolyte levels (Na,K,Cl), Table depicts correlation between GCS score and mean level of electrolytes like Na, K, Cl. Hypochloridaemia is seen in the GCS Score of 11-15

Figure 1 Shows the various causes of ICU Admissions (n=100) of the patients of our study along with the percentage. The most common system responsible for maximum ICU admissions was respiratory system.

DISCUSSION

Disturbances in fluid and electrolytes are among the most common clinical problems encountered in the Intensive Care Unit (ICU's).The most common clinically important electrolytes found in the body are Sodium (Na), Potassium (K) and Chloride (Cl).

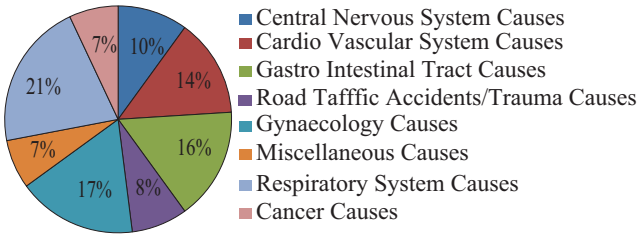

Figure-1: Showing the various causes of ICU Admission in 100 Patients

GCS score	Number of patients	Mean sodium (Na) (mEq/L)	Mean potassium (K) (mEq/L)	Mean chloride (Cl) (mEq/L)
3-5	3	143	4.6	108
6-10	7	139	4.6	88
11-15	90	137	4.5	77

Table-4: GCS vs mean electrolyte levels (Na,K,Cl)

The normal biochemical range of these electrolytes in serum are:-

a. Sodium 135-145 mEq/L
b. Potassium 3.5 – 5.5 mEq/L
c. Chloride 96 – 106 mEq/L

These electrolytes are the smallest of chemicals that are important for the cells in the body to function and allow the body to work. Electrolytes such as Na, K, Cl are critical in allowing cells to generate energy, maintain the stability of their walls and to function in general. The body functions in a very narrow range of normal; and concentration of electrolytes in the body is controlled by a variety of hormones.[4]

An electrolyte imbalance is a deviation in the serum levels of the electrolyte towards the higher side (hyper) or lower side (hypo) leading to adverse effects on the body systems and an array of serious problems like seizures and cardiac arrest. Up till now our study shows hyponatremia. Recent studies have reported that fluid and electrolyte imbalances are associated with increased morbidity and mortality in critically ill patients. To provide optimal care, health care providers must have knowledge with respect to the principles and practice of fluid and electrolyte physiology and pathophysiology. Development of hyponatremia in critically ill patients is associated with disturbances in the renal mechanism of urinary dilution and can lead to cellular dehydration and Central Nervous System Damage.

The serious, life threatening disorders such as burns, trauma, sepsis, Acute Liver Disease, heart failure and brain damage along with a myriad of medications used in the ICU's can lead to disturbances in fluid and electrolyte homeostasis.[4]

To the best of our knowledge, this is the first study of its kind carried out in western Maharashtra This study intends to provide readers with relevant information on fluid and electrolyte problems frequently observed in the ICU's. Levels of electrolytes in the body can become too high or low when the amount of water in the body changes, thus causing dehydration or over hydration.

Our results clearly show a reduced or low mean sodium level (134±7.5 mEq/L) in 30% patients of the ICU. Our results were found to be similar to a study by Rajesh Padhi et al[5] which reported that the frequency of hyponatremia in ICU admission was 34.3% out of which dividing on the basis of gender, females comprised 36.5%.

Another study by Friedman B et al[6] estimated the prevalence of hyponatremia in the ICU as high as 30% – 40% with patients of hyponatremia being at elevated risk of mortality vs normonatremic patients, most cases in the ICU being euvolemic or hypervolemic.

Another study done by Laczi F et al[7] found that mild to moderate hyponatremia and severe hyponatremia are found in 15% - 30% and 1% - 4% of hospitalized patients respectively.

One study by Rafat C et al[8] shows that hyponatremia is a very common electrolyte derangement seen in the setting of the Intensive Care Unit.

However the study of Waite et al[9] did not match with our study and revealed that hypernatremia was independently associated with a 40% increase in risk of hospital mortality and a 28% increase in ICU loss. Our study also shows normal mean levels of Chloride and Potassium.Usually, sodium level correlates directly with the sensorium.

As the serum sodium level falls, the consciousness becomes progressively impaired reflecting on low GCS score. In our study, the distribution of patients in each subgroup of GCS was unequal; most patients were with well preserved consciousness state. The mean serum sodium level in each group of GCS is variable and can not be graded with progressive decline in sensorium. A larger study with bigger sample size is warranted.

CONCLUSION

An accurate and reliable evaluation of the state of consciousness in Intensive Care Unit patients is of primordial importance for their management. Electrolyte disturbances are also common in ICU settings. Timely recognition, a high index of suspicion and a thorough understanding of these abnormalities are necessary to ensure their correction and reduce morbidity and mortality.[10] Therefore apart from the phenomenologic value, advances in the epidemiology of conditions like hyponatremia should also provide insights in the prognostic implications as well as in the prevention and management modalities of the disorder in various clinical settings.

Since this study was carried out at an institute located in rural area, we hope that our effort will benefit both, the doctors by establishing a possibility of early electrolyte imbalance and changed or altered sensorium in ICU patients, as well as rural patients. However the limitation of our study is that it was a pilot study based on a small sample size of only one centre. Substantial additional work is still required to determine the true occurrence of hyponatremia in the various clinical settings. We are planning to do the study on a larger scale, involving more centers and for a greater duration of time.

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